AD 401 409

TM(L)-1079

TECHNICAL MEMORANDUM

(TM Series)

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Indian Ocean Station Buffer

Milestone 3

by

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Approved

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1.0 Purpose.

This document describes program requirements for the Indian Ocean Station Buffer, a 160-A program system designed for use at the Satellite Control Facility. A general description of the programs, their interfaces, and scheduling are given. This document should be construed as a proposal subject to review before implementation proceeds.

2.0 General Discussion.

The Indian Ocean Station Buffer is designed to meet the peculiar communication problem between the STC and the Indian Ocean Station (hereafter IOS). All transmission will be over two fully-duplexed, 100 wpm teletype lines between the two facilities. The major design restrictions placed upon this program system are as follows:

a. No special hardware will be included in the proposal. All communications will be handled by punched paper tape input to the teletype equipment.

b. Data processing rates will be restricted to the transmission speed of the lines. While computer processing capability exceeds teletype line capacity, the amount of data punched at IOS should not result in excessive delay at the STC.

c. Prepass data of all appropriate varieties will be sent from the STC to IOS to support all vehicles.

d. Tracking data will be received from IOS and will be input directly to the 1604 through the use of STAPIN (Tracking Input Subroutine for Augmented 1604 Programs). All vehicles may be thusly supported.

e. Command status information from the T&C Computer will be received from IOS by manual teletype procedures without computer processing at the STC.

f. Telemetry data will be received from IOS and processed by the Bird Buffer Telemetry Module for display at the remote printers for Program 823 only.

g. Scheduling and usage of this program will be constrained by design restrictions implicit in the Augmented Satellite Control Facility System.

h. The basic message formats and data order between the Bird Buffer and Tracking Station will be used without modification.

3.0 Data Flow.

Figure 1 shows the data flow between the STC and IOS.

4.0 Program Descriptions.

This section lists modifications to existing functions and new programs.

4.1 IOSB

The Indian Ocean Station Buffer is made up of major components of the Bird Buffer System and two new programs to punch and verify paper tape. All messages referred to in this document are in the formats described in TM(L)-834/000/01A, Bird Buffer Combined Milestone 3-4, 14 February 1963.

4.1.1 Punch Paper Tape Module (SPUN).

Paper tape will be punched containing all prepass messages normally transmitted to a tracking station. This module will be capable of the following functions:

a. Providing visual header on paper tape giving vehicle number, rev. no., date, and system time of initial pointing data, and destination computer. This header will be used to file paper tape and will be transmitted to IOS.

b. Converting messages from 12-bit 160-A words to 5-bit paper tape codes. (See Appendix I for detailed examples of paper tape format.) Each 12-bit word will be divided into three 4-bit words. A parity bit will be added to each 4-bit word for verification.

c. Punching 5-level paper tape with spacing between messages.

d. Recognizing command messages and providing for punching commands twice.

e. As an option, writing a magnetic tape for conversion to paper tape on an off-line 160-A computer.

f. The module will be called by SPREP to punch paper tape.

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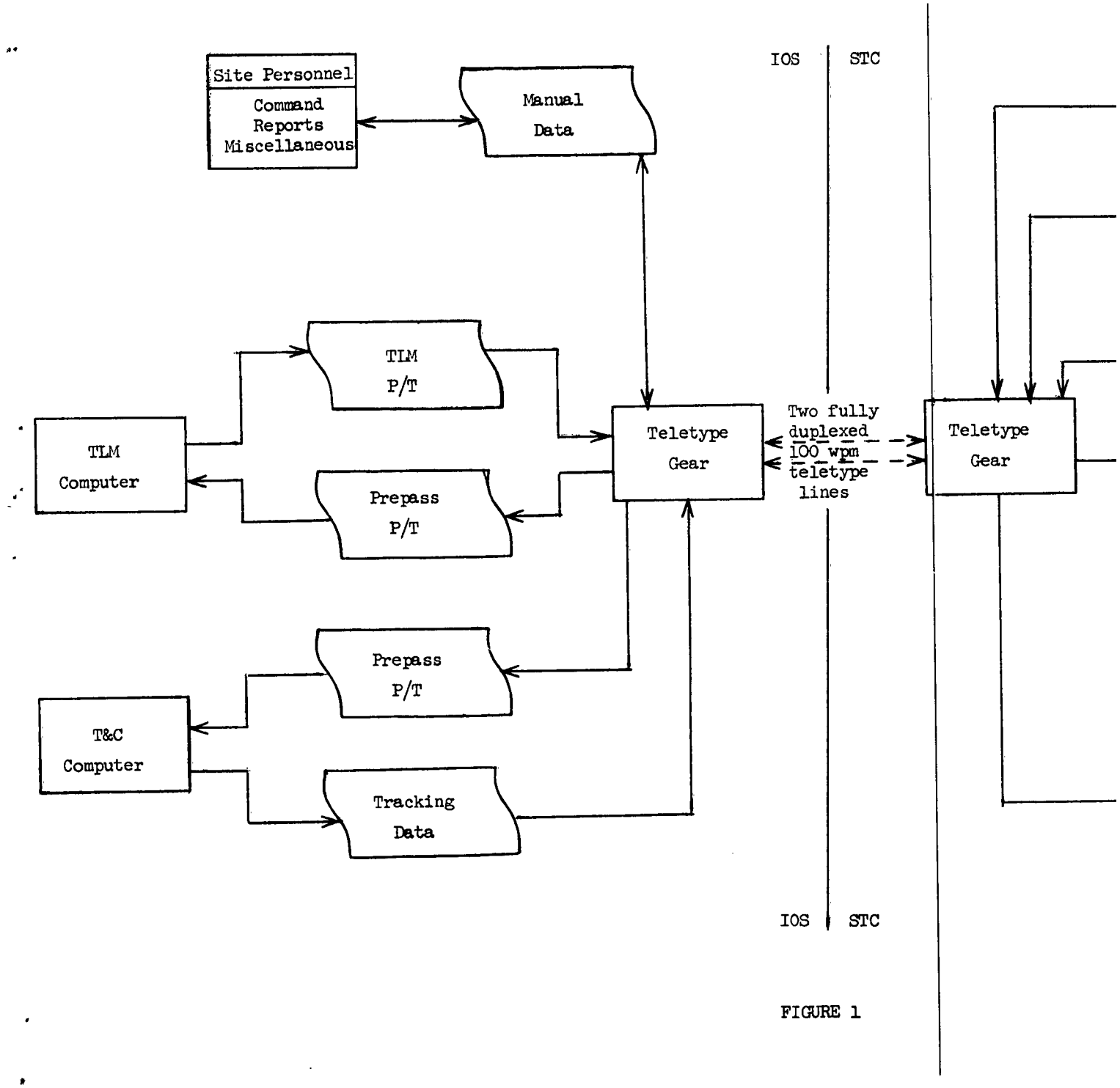

FIGURE 1

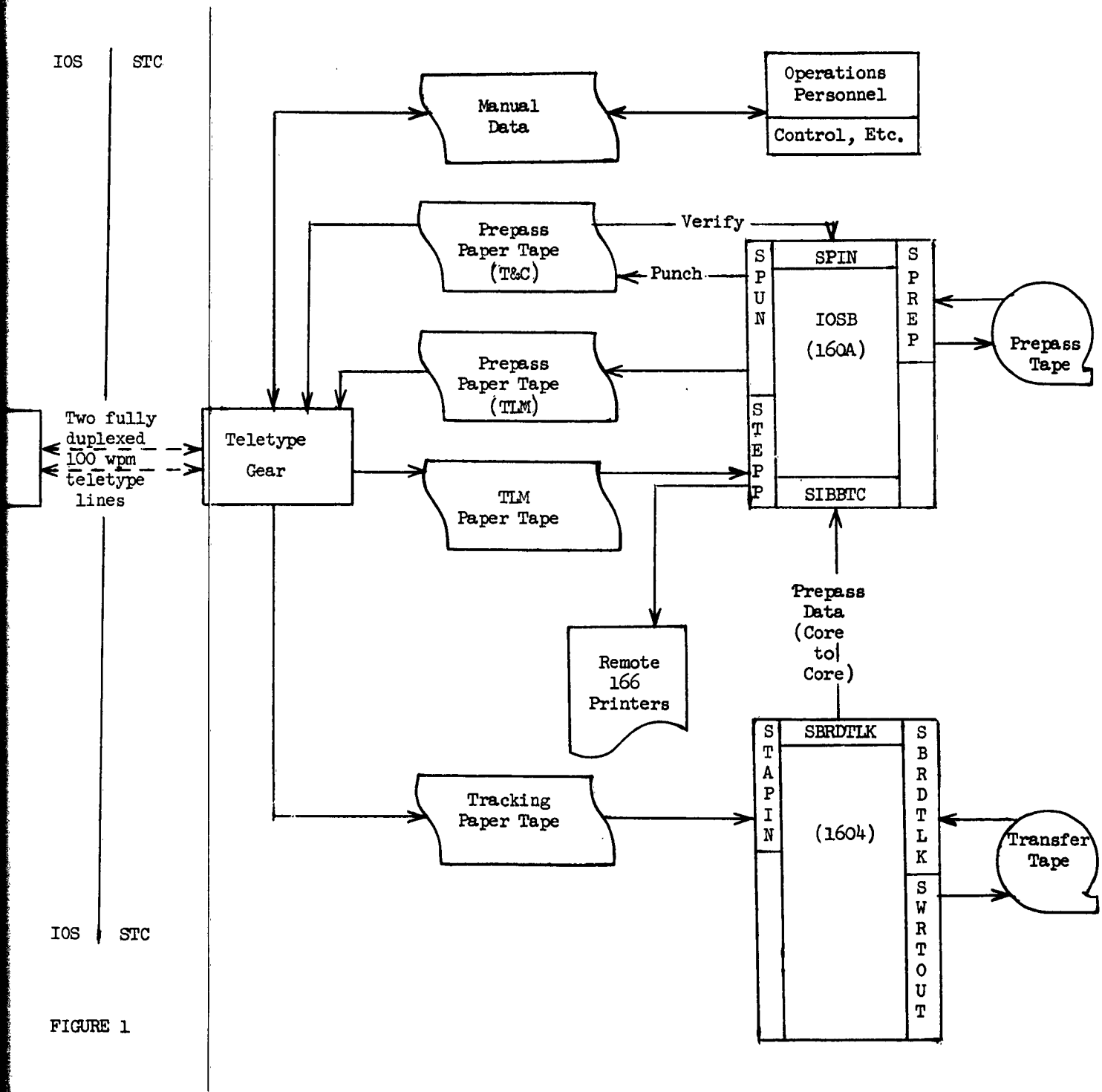
IOS
STC
Manual Data
Operations Personnel
Control, Etc.
Prepass Paper Tape (T&C)
Verify
Punch
SPUN
SPIN
IOSB (160A)
SPREP
Prepass Tape
Prepass Paper Tape (TLM)
STEPP
SIBBTC
Two fully duplexed 100 wpm teletype lines
Teletype Gear
TLM Paper Tape
Prepass Data (Core to Core)
Remote 166 Printers
STAPIN
SBRDTLK
(1604)
SBRDTLK
SWRTOUT
Tracking Paper Tape
Transfer Tape
IOS
STC

FIGURE 1

4.1.2 Verify Paper Tape Module (SPIN).

Paper tape punched by SPUN may be verified by the IOSB by calling SPIN. SPIN will be under the control of the executive module, SXCON. SPIN will be capable of the following functions:

a. Reading one or several passes worth of prepass paper tape.

b. Logging tape contents and error conditions.

c. Doing parity and checksum computations on all messages.

d. Comparing bit-for-bit successive command messages on the paper tape.

4.1.3 Executive Module (SXCON).

The executive module of the Bird Buffer System will be modified to allow punching and verification of paper tape and processing of telemetry paper tape for display at the remote printers. All those functions related to real-time contact with tracking stations and recording of pass data will be deleted to make space for new and amended modules. The Bird Buffer/1604 interface will remain intact (See TM(L)-834/000/01A, pp. 4, 62-65 for detailed description of this module). The major features of the non-station-contact mode of operation will be used for all new functions.

4.1.4 Input Processing Module (SPROC).

The input processing module will be modified to delete unwanted functions and add new functions. The following functions described in TM(L)-834/000/01A pp. 66-69 will be included in the IOSB.

a. **00 Initialize.
b. **02 Transfer Prepass.
c. **04 Merge Tape.
d. **06 Send Prepass (Modified to use paper tape and specify destination computer).
e. **07 Transfer Card Prepass.
f. **24 Send Text (STC Printers only).
g. **99 End.

New functions will be added as follows:

a. **25 Verify Paper Tape.
b. **26 Read Telemetry Paper Tape.

Function Card formats will be consistent with existing Bird Buffer card formats.

4.1.5 Prepass Module (SPREP).

The prepass module will require minor modifications to allow the calling of SPUN to punch prepass data instead of using the 1200-bit line.

4.1.6 Communications Module (SIBBTC).

The 1604/Bird Buffer functions will be used intact.

4.1.7 Telemetry Processing Module (STEPP).

The telemetry processing module, modified to support program 823 (823-specific features are neither listed nor costed in this document), will be used to provide telemetry displays at the remote 166 printers. Small modifications to printer timing will be necessary because time sequencing is not driven by "real-time" messages from IOS.

4.1.8 Utility and Control

All utility programs provided for the Bird Buffer System to assemble programs, load and correct master tapes, make up symbol tables, and bootstrap the system master tape will be used without modification. The operation of the IOSB will be exactly like the Bird Buffer in all common functions.

APPENDIX I

Sample Paper Tape Formats

H_{11}	H_7	H_3	S_5	S_1	A_3	M_{11}	M_7	M_3	C_{11}	C_7	C_3
H_{10}	H_6	H_2	S_4	S_0	A_2	M_{10}	M_6	M_2	C_{10}	C_6	C_2
H_9	H_5	H_1	S_3	A_5	A_1	M_9	M_5	M_1	C_9	C_5	C_1
H_8	H_4	H_0	S_2	A_4	A_0	M_8	M_4	M_0	C_8	C_4	C_0
P	P	P	P	P	P	P	P	P	P	P	P

$H_{11} - H_0$ = New Message Header (all 1's).
$S_5 - S_0$ = Station Number.
$A_5 - A_0$ = Message Code (001010 = 12).
$M_{11} - M_0$ = Telemetry Mode.
$C_{11} - C_0$ = Arithmetic Complement Checksum of the header message.
P's = Parity (odd).

Telemetry Report Header Message

H_{11}	H_7	H_3	S_5	S_1	A_3	M_{11}	M_7	M_3	B_{11}	B_7	T_{14}	B	T_7	T_3	N	N----	C_{11}	D_7	D_3	I_{11}	I_7	I_3	E....	K_{11}	K_7	K_3
H_{10}	H_6	H_2	S_4	S_0	A_2	M_{10}	M_6	M_2	B_{10}	B_6	T_{13}	T_{10}	T_6	T_2	N	N----	B	D_6	D_2	I_{10}	I_6	I_2	E....	K_{10}	K_6	K_2
H_9	H_5	H_1	S_3	A_5	A_1	M_9	M_5	M_1	B_9	T_{16}	T_{12}	T_9	T_5	T_1	N	N----	D_9	D_5	D_1	I_9	I_5	I_1	E....	K_9	K_5	K_1
H_8	H_4	H_0	S_2	A_4	A_0	M_8	M_4	M_0	B_8	T_{15}	T_{11}	T_8	T_4	T_0	N	N----	D_8	D_4	D_0	I_8	I_4	I_0	E....	K_8	K_4	K_0
P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P----	P	P	P	P	P	P	P....	P	P	P

H_{11} - H_0 = New Message Header (all 1's).

S_5 - S_0 = Station Number.

A_5 - A_0 = Message Code (001011 = 13).

M_{11} - M_0 = Telemetry Mode.

B_{11} = 1 if message contains "Event" only.
= 0 if fixed format words in message.

B_{10} - B_6 = Blanks (zeros).

T_{16} - T_{11} = 6 most significant bits of system time, in seconds.

T_{10} - T_0 = 11 least significant bits of system time, in seconds.

N = Fixed Format telemetry items.

C_{11} = 1
C_{10} = 0
} Ident bits of "Event" associated system times.

D_9 - D_0 = 10 least significant bits of associated system time if C_{11} = 1, ident otherwise.

I_{11} - I_9 = 0 (ident bits of Event Identifications).

I_8 - I_0 = Identification number of event telemetry item.

E's = Event value.

K_{11} - K_0 = Arithmetic Complement Checksum for one message.

P's = Parity (odd).

Telemetry Report Message

K_{11}	K_7	K_3 ------------------------	H_{11}	H_7	H_3	S_5	S_1	A_3	R_{11}	R_7	R_3	F_{11}	F_7	F_3
K_{10}	K_6	K_2 ------(15 blanks)--------	H_{10}	H_6	H_2	S_4	S_0	A_2	R_{10}	R_6	R_2	F_{10}	F_6	F_2
K_9	K_5	K_1 ------------------------	H_9	H_5	H_1	S_3	A_5	A_1	R_9	R_5	R_1	F_9	F_5	F_1
K_8	K_4	K_0 ------------------------	H_8	H_4	H_0	S_2	A_4	A_0	R_8	R_4	R_0	F_8	F_4	F_0
P	P	P------------------------	P	P	P	P	P	P	P	P	P	P	P	P

$K_{11} - K_0$ = Last message Arithmetic Complement Checksum.
$H_{11} - H_0$ = New Message Header. (7777)
$S_5 - S_0$ = Station Number.
$A_5 - A_0$ = Message Code (010000 = 20)
$R_{11} - R_0$ = Fade Message Ident (010000000011 = 2003).
$F_{11} - F_0$ = Fade Message Arithmetic Complement Checksum.
P's = Parity (odd).

Telemetry Report Fade Message

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Satellite Networks.

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program system designed for use at
the Satellite Control Facility.
Gives a general description of the
programs, their interfaces, and
scheduling.

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